

be recollected that he did not adopt Gothic but in cases of necessity like the present, and that he gave a decided preference to what was considered a new and better style.

With reference to the construction of these edifices, it will be hardly necessary to observe, that Wren's towers and spires were built "in the most substantial and workmanlike manner," and to adapt the words of modern specifications still further, "the materials used were the best of their respective kinds;" but here ends the similitude. Wren put a different construction on these words from that frequently given in the present day; with him none of the funds which should be expended in stability were wasted in decoration—a fault which is, perhaps, mainly attributable to the present defective state of competitions, with which Wren was not troubled. The walls of the towers vary from five to seven feet in thickness, and are of solid masonry, sometimes backed up with brick, but generally with stone of a rougher description. The stone is Portland, the timber oak, and the lead must have weighed at least 10 lbs. to the foot superficial. The floors in nearly all the towers are carried upon corbels, a preferable mode to inserting the ends of the beams in the walls, as the floors are more readily replaced when decayed, and the walls are not so liable to be injured by fire or strains. The towers have in nearly every instance convenient access to the belfry or parapet by circular stone staircases; and it is worthy of notice that the front line of the steps runs to the centre, and not to the face of the newel, as is usual in Gothic staircases: this perhaps occasions a little more work, but gives a much better tread. The block cornices and enriched parapets, which are so frequently imitated in the more modern parts of the metropolis, were first used by Wren.

Wren observes, that spires were of Gothic extraction, to which, however, his imitations have no further resemblance than their pyramidal outline. Those nearest approaching Wren's are the Lombardic and Italian campanili, and though Wren does not appear to have visited these countries, still he was, doubtless, well aware of their existence and forms: they are, however, quite a distinct species, are of vast dimensions, and have different proportions. The earlier campanili date from more than 1,000 years before Wren's time: their upper parts are divided into a number of equal stories, enriched with arches, and the upper stories were, subsequently, frequently broken into the octagonal form, and covered with a spire, from these were derived the Norman, and afterwards the beautiful Gothic steeples, as at Boston, Louth, and Salisbury. When the Gothic was exhausted, the Italian architects of the revival returned pretty closely, but with greater refinement, to the forms of the early campanili, though but few, if any, of their works can be called spires, so that it remained for Wren to rival these Gothic edifices, but in the Roman style and detail. It will thus be seen, architecture being more a science of growth than of positive invention; that spires were first derived from Roman architecture about 1,000 years ago, were continued and perfected in Gothic architecture during a space of 500 years, and were afterwards re-transplanted into their original style, in which the genius of Wren has made them flourish with equal success. In a paper read before the Institute, Mr. P'Anson observes with respect to campanili, "Perhaps there are no finer modern instances to be met with than the beautiful compositions of our countryman, Sir Christopher Wren," and having paid, probably, more attention to this subject than any one, I can most completely concur in Mr. P'Anson's statement.

The great difference between Wren's spires and the revived Italian campanili is, that the former have a lofty pyramidal outline, are divided into three, four, or five stories, and are enriched with open stages of columns or pilasters. The columns used in this elevated position are differently treated than when placed near the ground, and the orders have a much bolder description of detail. To design a spire in this style requires a good knowledge of perspective, for, as Wren observes, "Every-

thing that appears well in orthography, may not be good in model, and every thing that is good in model, may not be so when built; but, this will hold universally true, that whatever is good in perspective, will hold as in the principal views; if this caution only be observed, that regard be had to the distance of the eye in the principal stations."

With reference to their composition, Wren also gives some further valuable information. "Things seen near at hand may have small and many members, be well furnished with ornaments and lie flatter: on the contrary, all this care is ridiculous at great distances: there bulky members, and full projections casting quick shadows are commendable: small ornaments at too great distance serve only to confuse the symmetry, and to take away the lustre of the object by darkening it by many little shadows. There are different reasons for objects whose chief view is in front, and for those whose chief view is sideways."

In this branch of design, it should be noticed that Wren has had many able followers, foremost among whom stand his pupils, Gibbs and Hawksmoor, then Vanbrugh, Dance, Archer, James, and Pilecroft. Gibbs built St. Martin's-in-the-Fields, and St. Mary's, in the Strand; Hawksmoor, St. George's, Bloomsbury, and St. Mary's, Woolnoth; Dance built St. Leonard's, Shore-ditch; Archer, St. Philip's, Birmingham; James, St. George's, Hanover-square; and Pilecroft, St. Giles-in-the-Fields. All these are very beautiful examples, more especially the two first, by Gibbs and Hawksmoor. Dance, in the spire at Shore-ditch, has imitated the outline of St. Mary-le-Bow, but on a smaller scale; the circular peristyle of columns, which is perhaps the weakest part of the latter, being strengthened by arched walls returning from the columns to the cylinder within. The story above has a domed covering instead of open flying buttresses—by which it gains in solid appearance, but loses in lightness and elegance. These examples have all their relative excellence, but taken as a whole, they cannot be compared to Wren's best examples, St. Mary-le-Bow, St. Bride's, and St. Vedast's.

At the close of the paper,—

Mr. Fowler stated that he had examined closely the spire of St. Dunstan's in the East, and could confirm what Mr. Clayton had said as to the joints of the flying buttresses. These were not at right angles to a tangent of the curve as in ordinary arch work, but were continued horizontally up to very near the conjunction of the four flying buttresses: so that the higher or upper joint seemed to him to occasion some little weakness. It was of course a balance of consideration, between the benefit to be gained by spreading the lateral thrust, and the danger incurred by the weakness of the stone at the acute inner angle.

Mr. C. Nelson drew attention to the campanili, or western towers of St. Paul's, which had not been mentioned, but which he had always regarded as extremely beautiful. By M. Quatremere de Quincy,* they were quoted in disparagement of Wren, but as seen from Ludgate Hill (and he hoped they would some day be better seen, and the cathedral be thrown more open to view), he could not but regard them as highly effective. The mode of construction in the domed part of Wren's spires by the adoption of horizontal instead of radiating joints, recalled a much more ancient employment of that system, in the Treasury of Atreus, at Mycenæ in Greece, which he believed Professor Donaldson had been the first to elucidate. The staircases in the spires of Bow and St. Bride's were very interesting: he believed the hint for the way in which the latter was carried, and the strength afforded by it was derived from natural objects,—from a study of conchology.

A conversation arising as to lightning conductors,—Mr. Hesketh said, the present practice was to connect the lightning conductor as much as possible with all the metal work of the building, and to carry it down into the earth; and this might be done by connecting it with a water-pipe.

Mr. Goring said, that was the case at St. Paul's, where the conductor was connected in numerous places with the rain water-pipes and the lead work.

Mr. C. H. Smith, visitor, stated, as the result of his examination of the spire of St. Martin's Church, that the lightning appeared to have struck the vane, and run down the rod supporting it; and the mischief began where that rod terminated. The current went from that point to the stone work in the spire,

which was fixed together with very strong iron cramps run with lead; and in its passage through the stone from one of these cramps to another, the masonry was split in a spiral line all round, hardly one of the stones in that line remaining entire. It then made its way to the lead work of the roof, and down the metal pipes inside the phytoria. As to the principle of lightning conductors, it was well known that a bell-wire would serve to transmit the current; but the danger was that so much heat might be generated as would melt the wire; and therefore it was necessary to make the conductor of sufficient substance to prevent its being fused. With respect to the masonry, he observed that Wren had used in some of his churches, as in the porch of St. Bride's and the inside of St. Paul's, a soft and cheap description of stone, which came, he believed, from Windrush, near Bedford, in Oxfordshire. The Portland stone of Wren's churches, and others, to the year 1740 or 1750, was extremely coarse and full of a species of large oyster-shell. This might be noticed in Hawksmoor's Church (St. Mary's Woolnoth), Lombard-street. This kind of stone had been brought from the eastern side of the Isle of Portland, where a large quantity of it still remained. This was proved by the documents in the possession of the family whose ancestors supplied the stone for St. Paul's and Greenwich Hospital. It was then called best bed stone, being the best then known, and it still retained that name,—although much better stone was now worked. The Portland stone now in use was introduced not long before the time of Sir W. Chambers; and the north front of Somerset House would be found to be of a very superior kind of stone to that of Wren's time.

Mr. Irvine, visitor, explained, from his own observation in drawing it for the Royal Academy, about six months ago, the construction of the upper part of the spire of Bow Church, in the masonry of which (in the solid part of the drum) pieces or dowels of English oak were inserted, apparently to diminish the vibration. He felt sure they were placed there when the spire was first erected. From the want of a proper conductor, this spire was very liable to injury from lightning.

The following Table shows the Height, &c. of the principal Italian Campanili.

	English Feet Height.	Proportion of Height to Base.
Cremona, Il Torrazzo	396	—
Square part, two-thirds of whole height	—	6
Venice, S. Marco	350	—
Square part, two-thirds of whole height	—	6
Sienna, Torre del Mangia	338	—
Modena, la Ghirlandina	315	—
Bologna, Torre Asinilli	312	12
Florence	273	6
Parma	256	8
Sienna, Cathedral	210	8
Pisa, leaning Tower (circular)	178	3
Lucca	177	—
Bologna, Torre Garisendi	161	—
Rome, S. Maria in Cosmedin	110	7
Pisa, S. Nicola	109	3

Heights of Western Towers and Spires of some Cathedrals.

	Feet.
Cologne	514
Ulm	491
Strasbourg	452
1122—1152 Fribourg	415
1420—1514 Antwerp	403.7
York	195
1350 Salisbury	404
Old St. Paul's	520
Vienna	465
Boston, Lincoln (Church)	266
Norwich	309
Chichester	300
Lichfield	252
Lincoln	264
Canterbury	230
Gloucester	223

LIGHTNING CONDUCTION.—A discovery akin to that of Mr. G. Little, lately noticed in our columns, is said to have been made by Mr. Rodger Brown, of Sheffield; namely, that magnetized steel has pre-eminent power to attract the lightning when used in conductors instead of the ordinary article. By this means, and by multiplying the number of points in the head of the conductor, its attractive power is said to be tripled in intensity, its influence extending to some distance round the spot where it is fixed.

* Dictionnaire d'Architecture. Article, Clocher.